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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/554,188	10/21/2005	Natsuo Tatsumi	20239/0202826-US0	2644

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EXAMINER	
BREVAL, ELMITO	
ART UNIT	PAPER NUMBER
2889	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/554,188	TATSUMI ET AL.	
	Examiner	Art Unit	
	ELMITO BREVAL	2889	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 October 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *08/17/2006;10/21/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 9, and 16-19 rejected under 35 U.S.C. 103(a) as being unpatentable over Masahiro (JP: 4-245135) of record by the applicant in view of Osamu et al., (hereinafter "Osamu") (JP: 10-294077) of record by the applicant.

Regarding claim 1, Masahiro discloses (in at least fig. 4; [0012]-[0016]) an electron emission device comprising: a light emitting device for irradiating light to a cathode with at least an electron emission face of said cathode, but fails to disclose the face is made of diamond.

However, Osamu teaches (in at least figs. 1-5; [0012]-0015]; abstract) an electron emission device wherein at least an electron emission face is made of diamond, for the purpose of generating high electric field ([0004]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the diamond face of Osamu into the device of Masahiro, for the purpose of generating high electric field.

Regarding claim 9, Osamu discloses (in at least figs. 1-4) the electron emission face contains a sharpened projection part. The reason for combining is the same as for claim 1.

Regarding claim 16, Masahiro-Osamu disclose the electron emission device according to claim 1, is composed as one unit with said cathode.

Regarding claim 17, Masahiro discloses (in at least fig. 4, [0012]-[0016]) an electron beam source electron emission device, wherein a light emitting device for irradiating a cathode and a cathode, but fails to disclose at least an electron emission face is diamond, are disposed together in an electron gun.

However, Osamu teaches (in at least figs. 1-5; [0012]-[0015]) an electron emission device wherein the face is made of diamond, for the purpose of generating high electric field ([0004]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the diamond face of Osamu into the device of Masahiro, for the purpose of generating high electric field.

Regarding claim 18, Osamu discloses (in at least fig. 2) an anode is separated by a space from said cathode, in which at least an electron emission face is diamond; and a voltage that is positive relative to said cathode is applied to said anode. The reason for combining is the same as for claim 1.

Regarding claim 19, Osamu discloses (in at least fig. 2; [0010]-[0015]) a control electrode is disposed between said cathode and said anode to regulate an emission electron current and said cathode. The reason for combining is the same as for claim 1.

Claims 2, 8, and 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masahiro (JP: 4-245135) of record by the applicant and Osamu et al., (hereinafter “Osamu”) (JP: 10-294077) of record by the applicant as applied to claim

1 above, and further in view of Hirabayashi (US. Pat: 5,541,423) of record by the applicant as (JP 5-152604 A).

Regarding claim 2, Masahiro-Osamu disclose the electron emission device of claim 1, but fail disclose the light emitting device is made of diamond (col. 4, line 45).

However, Hirabayashi teaches (in at least figs. 1-10; abstract) a device wherein the light emitting device is made of diamond, for the purpose of avoiding leakage.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the light emitting device made of diamond as taught by Hirabayashi into the device of Masahiro-Osamu, for the purpose of avoiding leakage.

Regarding claim 8, Hirabayashi discloses (abstract) the light emitting device is composed of a pn junction of diamond, a schottky junction or a MIS structure. The reason for combining is the same as for claim 2.

Regarding claim 10, Hirabayashi discloses (col. 1, line 19) the wavelength energy of light emitted from said light emitting device includes 5.4 eV. The reason for combining is the same as for claim 2.

Regarding claim 11, Hirabayashi discloses (col. 1, line 19) the wavelength of light emitting device is greater than 2 eV. The reason for combining is the same as for claim 2.

Regarding claim 12, Hirabayashi discloses (in at least figs. 1-10; col. 4, lines 11-29) the light from said light emitting device excites electrons in an impurity level to a conduction band. The reason for combining is the same as for claim 2.

Regarding claim 13, Hirabayashi discloses (in at least figs. 1-10; col. 3, lines 54-60; col. 4, lines 11-29) the light emitting device excites electrons in a band gap level to a conduction band. The reason for combining is the same for claim 2.

Regarding claim 14, Hirabayashi discloses (in at least figs. 1-10; col. 4, lines 4-5; lines 57-68) the light from light emitting excites electrons in a level resulting from grain boundary defect. The reason for combining is the same as for claim 2.

Claims 3, 6, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masahiro (JP: 4-245135) of record by the applicant and Osamu et al., (hereinafter "Osamu") (JP: 10-294077) of record by the applicant as applied to claim 1 above, and further in view of Hisahiro et al., (hereinafter "Hisahiro") (JP: 2001-68011) of record by the applicant.

Regarding claim 3, Masahiro-Osamu discloses the diamond emission device according to claim 1, but fail disclose the electron emission face of said cathode is an n-type diamond semiconductor.

However, Hisahiro teaches a device wherein the electron emission face of said cathode is an n-type diamond semiconductor ([0010]; claim 1), for the purpose of emitting electron in the conduction zone.

Given the teaching of Hisahiro, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate n-type diamond semiconductor as taught by Hisahiro into the device Masahiro-Osamu, for the purpose of emitting electron in the conduction zone.

Regarding claim 6, Hisahiro discloses the electron emission face of the cathode is hydrogen terminated ([0010]). The reason for combining is the same as for claim 3.

Regarding claim 15, Hisahiro discloses ([0025]) the n-type diamond contains as an impurity and a least element of sulfur. The reason for combining is the same as for claim 3.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masahiro (JP: 4-245135) of record by the applicant and Osamu et al., (hereinafter "Osamu") (JP: 10-294077) of record by the applicant as applied to claim 1 above, and further in view of Hiroyuki (JP: 2000-243217A) of record by the applicant.

Regarding claim 4, Masahiro-Osamu disclose the diamond emission device according to claim 1, but fail to expressly disclose the electron emission face of said cathode is a p-type diamond semiconductor.

However, Hiroyuki teaches a diamond device wherein the electron emission face is a p-type diamond semiconductor (abstract), for the purpose of injecting electron using a low threshold voltage.

Given the teaching of Hiroyuki, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the p-type semiconductor device of Hiroyuki into the device of Masahiro-Osamu, for the purpose of injecting electron using a low threshold voltage.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masahiro (JP: 4-245135) of record by the applicant and Osamu et al., (hereinafter "Osamu") (JP: 10-294077) of record by the applicant and Hiroyuki (JP: 2000-243217A) of record by the

applicant as applied to claim 4 above, and further in view of Kurokawa et al., (hereinafter "Kurokawa") (US. Pat: 6,445,114 B1).

Regarding claim 5, Masahiro-Osamu-Hiroyuki disclose the device of claim 4, but fail to disclose the p-type diamond semiconductor includes crystal defects or an sp2 component.

However, Kurokawa teaches a device wherein the p-type semiconductor includes crystal defects (col. 3, lines 9-10), for the purpose of enhancing the electric field of device.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the p-type semiconductor material as taught by Kurokawa into the device of Masahiro-Osamu-Hiroyuki, for the purpose of enhancing the electric field of the device.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masahiro (JP: 4-245135) of record by the applicant and Osamu et al., (hereinafter "Osamu") (JP: 10-294077) of record by the applicant as applied to claim 1 above, and further in view of Hisashi (JP: 2001-118488) of record by the applicant.

Regarding claim 7, Masahiro-Osamu disclose the device of claim 1, but fail to disclose the electron emission face of said cathode is oxygen terminated.

However, Hisashi teaches a device wherein the electron emission face is oxygen terminated ([0056]-[0066]), for the purpose of improving the focusing of the emission current by inhibiting diffusion of the electrons emitted therefrom.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the electron face as taught by Hisashi into the device of Masahiro-Osamu for the purpose of improving the focusing of the emission current by inhibiting diffusion of the electrons emitted therefrom.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Michael (WO/93/15522), Kang et al., (WO/98/44529), Minoru et al., (JP: 10-149761), Osamu et al., (JP: 11-166860) all these arts are of record by the applicant.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ELMITO BREVAL whose telephone number is (571)270-3099. The examiner can normally be reached on M-F (8:30 AM-5:00 Pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Toan Ton can be reached on (571)-272-2303. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

March 14, 2008
Examiner
Elmito Breval

/Joseph L. Williams/
Primary Examiner, Art Unit 2889